

THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

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SMALL, CHEAP, QUAKE RECORDER INVENTED

The invention of a portable seismometer or earthquake measuring instrument, cheap, accurate, and easily set up, was recently announced by Dr. Arthur L. Day, director of the Geophysical Laboratory of the Carnegie Institution of Washington. The new instrument will be used in a study to be made of earth movements in California.

The advance over the older type of seismometer made through the invention of this new type may be measured from the facts that the old type costs several thousand dollars, weighs tons, and occupies a large amount of space, while the new instrument costs about \$25 and may be quickly taken down and packed in an ordinary suitcase.

The principle of the new invention is the twisting effect of earth movements upon a piece of fine vertical wire to the middle of which is attached by one side a small weight. The ends of the wire are fastened to a framework which in turn rests upon a solid pier of masonry or other structure fastened securely to the earth's surface. Earthquakes move this framework while the attached weight remains still. This results in a twisting of the wire which is measured by the reflection of a beam of light from an attached mirror. A continuous record is possible by directing the beam of light upon a roll of photo-sensitive paper revolved by clockwork.

The apparatus itself seems extremely delicate to measure such a crude force as an earthquake. The wire is similar to the ordinary electric light wire filament and is about seven and a half inches long. The attached weight is a piece of copper about four-fifths of an inch long and one tenth as thick, the mirror is about one-sixth by one-tenth of an inch.

Astonishing results have been obtained from the two of these little seismometers in use since last February in Pasadena, Cal. The Japanese earthquake was recorded in great detail from the beginning to the end. No little tremors in California go unrecorded. The device is sensitive to the passage of a street-car at a distance of three-quarters of a mile, while a railway train at a somewhat greater distance left a characteristic record.

Important practical applications are expected to follow the installation of numbers of these little instruments at different parts of California. It will easily be possible not only to record each quake but to determine its di-

rection and to track it to its lair. The machines may also be used for the recording of "artificial earthquakes" produced by the explosion in abandoned mines of left-over war explosives. Placed at varying and considerable distances from such explosions the record would be of great importance in determining little-known conditions in the deeper crust of the earth through which the waves would pass, conditions which might throw much light on the origin of quakes.

The instrument now in Pasadena accurately recorded a similar explosion 60 miles away last month when 115,000 pounds of blasting powder were set off at Palos Verdes.

Old fashioned seismometers or seismographs have been, because of their expense, rather a rarity in this country. With this new device it now becomes possible to set up a recording stations and to broaden the knowledge of the earth's crust accordingly.

Incidentally, it becomes possible to take a moving picture of an earthquake wave. In experiments made at Pasadena, motion-picture film was used to record the movements of the earth. While it was used no real earthquake occurred but had one done so it would have been possible to have run the film through a projector and to have shown the sinuous vibrations on the screen. But it would be rather expensive and impractical to use film and to wait for days perhaps for a quake whose photograph was worth taking.

READING REFERENCE - Davison, Charles. The Origin of Earthquakes. New York, Macmillan Company, 1912.

MOTHER EARTH HAS HARD, HEAVY HEART

The earth is built somewhat on the same principle as an old-fashioned metal-cored golf ball around which are wrapped several layers of lighter material ending in a thin surface crust. The metal core is pure iron or an alloy of that metal with nickel, says a report of Drs. E.D. Williamson and L.H. Adams, scientists of the Carnegie Institution of Washington, to the Washington Academy of Sciences.

They say that it is possible that the inmost core of the earth may be gold, or platinum, or other metals heavier than iron, but that it is practically certain that the center of the earth is an irregular sphere of iron about 4,200 miles in diameter. From the outer edge of this core, which is not sharply defined, to the surface is about 1800 miles, and this distance is divided into three layers.

Next to the central iron core, Drs. Williamson and Adams relate, is a sort of mixed layer of iron and of rock, which extends with a gradually diminishing proportion of iron to within about 900 miles of the surface. Above this is a layer of rock, resembling that found at the surface but containing more magnesia and less silicates. Finally, there is the surface crust, about 35 miles thick, consisting essentially of the granitic rocks.

All this insight into the earth's anatomy is afforded, the scientists say, through a study of the velocity of earthquake waves through the earth, mathemat-

ical considerations having to do with the mass of the earth as a whole, and a study of meteorites, whose average composition is believed to closely resemble that of the earth as a whole. For example, it is known that the density of the whole earth is about 5.52 times that of water, while the average density of the surface rocks is only 2.7. There must therefore be something heavier inside.

Pressure has something to do with that, as by squeezing the material of the rocks closer together it would make them denser, but the authors of the report state this would not be enough to cause such a great increase of density as is needed to explain the average density of the earth. The pressure at the center of the earth is calculated to be about 25,000 tons to the square inch.

READING REFERENCE - Chamberlain, T. C. Origin of the Earth. Chicago, University of Chicago Press, 1916.

Gregory, J.W. Geology of Today. Philadelphia, J.B. Lippincott Company, 1915.

ONE AUTO DEATH TO FIVE FROM TUBERCULOSIS

One person died from an automobile accident during October to five who died from all forms of tuberculosis, according to a report just issued by Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, on the mortality during that month among the 14,500,000 industrial policyholders of that company. Auto fatalities were at the record-breaking figure of 19.4 per 100,000, never equalled in any previous month. Fatal accidents of all sorts showed an increase of 25 per cent. over the corresponding month of last year. Commenting on these figures, Dr. Dublin said to Science Service:

"The almost constant comments made on the high automobile fatality rate by those concerned with the health and safety of the American people may seem like ceaseless repetition. However, they merely fulfill the obligation to keep emphasizing this deplorable condition until we are successful in turning the tide. In August we stated that little doubt remained that the 1923 automobile fatality rate would be higher than ever before; now no doubt whatever remains. In this group of more than 14 million persons, the leading cause of death during October, organic heart disease, was responsible for only six deaths for every automobile fatality; and all forms of tuberculosis combined caused only five deaths to one from an automobile accident."

The death rate among the industrial policyholders for October was eight per 1,000, which is substantially the same as that for October of last year. The 1923 year-to-date death rate is only a very little higher than the 1922 rate at this time last year. It thus becomes more and more probable as the year draws to a close, that unless health conditions change sharply for the worse in December, the death rates for 1923 and 1922 will be practically the same. The year opened with the most unfavorable first quarter since 1920, but this has been followed by the best eight months in the health history of the industrial policyholders.

NAVIGATION LIGHTS FOR NIGHT-FLYING AIRPLANES

Navigation lights on airplanes as well as beacon and boundary lights at landing fields were recommended by Lieutenants H.R. Harris and D.L. Brunner of the U.S. Air Service in an address before the American Society of Mechanical Engineers recently. In addition to these, parachute flares and hand flashlights or similar devices for signalling purposes were advised.

The beacons at terminal landing fields should have a candlepower of at least 250,000, they stated, and illuminated wind cones should be provided at every landing field. With these aids, night flying could be carried on with safety and reliability, the officers declared.

MINING WITH SMOKE

Mexicans working in a lead mine in Chihuahua have found a new use for cigarettes. The mine consists of a series of caves along the sides and bottoms of which lead and silver ore in paying quantities is found. The miners have noticed that smoke from their cigarettes is sucked through cracks in the rocks at certain points. By drilling in the wake of the smoke, they break through into another cave. This method of tracing the ore has been followed through a series of caves and still the smoke passes out at the end of the last cave discovered, indicating that there are other caves ahead.

EINSTEIN OBSERVATORY BUILT NEAR POTSDAM

The Einstein observatory, built with funds contributed by foreign adherents of the Einstein theory, has recently been completed near Potsdam, Germany. It contains a large telescope and other astronomical facilities for testing and studying the theory of relativity and the newer theories concerning light.

GERMAN MARK BUYS THREE BILLION GOLD ATOMS

The German mark, supposed to be the closest approach to monetary zero will still buy 3,000,000,000 atoms of gold. Dr. Paul Foote, chief of the division of atomic physics of the National Bureau of Standards, prepared these figures on the occasion of the visit to Washington of Prof. Niels Bohr, Danish physicist who won the Nobel prize for his investigations of the atom. Sixty cents would buy one trillion marks when Dr. Foote made his computations, and gold is worth \$20.67 an ounce. One nearly worthless mark will buy 16,000 atoms of radium, the most expensive element in the world.

"The figures show the extreme minuteness of the atoms which Dr. Bohr investigates," Dr. Foote said, "and these atoms are miniature solar systems whose electron planets can be detected and studied".

DISCOVERS LIGHT AFFECTS ELECTRICITY IN NEW WAY

A new photo-electric effect has been discovered by Dr. Irving Langmuir of the Research Laboratory of the General Electric Company at Schenectady.

It is declared to be different from any phenomenon previously observed and contrary to what was to be expected.

Light falling on a metal sets the electrons vibrating and they are so severely agitated that they tear themselves loose from the surface and shoot out into the air. In other words, light draws an electric current from the metal it falls upon. This is known as the ordinary photo-electric effect and was discovered a quarter of a century ago by the German physicist, Hallwachs.

High temperature also throws electrons out of a metallic surface. This effect, discovered by Thomas A. Edison, is now known as the thermionic effect. It was used by J.A. Fleming in detecting wireless waves by means of the electron vacuum tube and his design was improved by Dr. Lee de Forest into the triode tube familiar to radio fans.

Now Dr. Langmuir in studying the relation of these two effects has discovered an entirely new photo-electric effect. He finds that light falling on a caesium coated nickel surface not only produces the ordinary photo-electric effect of tearing electrons out of the surface, but also prevents some of the electrons, being shot against it by a thermionic effect, from entering the surface. Many more are reflected when the light falls upon the surface than when it is dark, and the new effect is therefore entirely different from that previously known. Any connection between the two was shown to be remote when Dr. Langmuir found that a red glass screen in the path of the light stops the new effect but leaves the ordinary photo-electric effect unchanged.

How this new phenomenon is to be explained or used practically is yet to be determined.

PASTURES FEED HALF OF CATTLE

Outlines of a plan for the study and improvement of the pasture lands of the United States have been prepared by the Advisory Committee of the American Society of Agronomy for the National Research Council. The purpose of the proposed investigations is in general to find practicable means for the conservation and improvement of the pastures which feed more than half of the cattle and other farm animals in the country.

The Committee states that two-thirds of the cultivated area in crops in the United States is devoted to the production of feed for livestock, the proportion varying in different sections from 91 per cent in New England to 51 per cent in the west south central states. From other studies it appears, the Committee says, that since all the forage consumed in one year would feed about 50,000,000 adult cattle or their equivalent, and since there are more than twice that number in the country, it follows that over one-half of their feed was furnished by pasturage. It is estimated that pasturage costs only about one-fourth as much as harvested forage.

"The neglect of tame pastures and the abuse of natural wild pastures is a disgrace to American agriculture," the Committee declares. "Only the fact that grass will stand an almost incredible amount of abuse has prevented its utter destruction. Relegated to land too rough to till, neglected by the farmer, abused by the grazer, ignored by the investigator, the permanent pastures still furnish at least one-third of the feed consumed by domestic animals. 'Better pastures' should become the slogan of American agricultural progress."

The outlined investigation provides for the preparation of maps of the grass-lands, both natural and artificial; studies of pasture plants, soils and the effects of grazing; production of meat, wool, etc., to the unit area; period and rate of grazing; fertilizers; troublesome and poisonous plants; animals and insect pests; and economic and social problems. The proposed investigations would be carried out on farms of from 150 to 300 acres, located in the principal grazing areas of the country.

In view of the enormous importance of pastures, there is need for liberal appropriations to conduct the necessary investigations. Pasture investigations have heretofore been much neglected due to lack of funds to do the work.

READING REFERENCE - Brigham, Albert P. Geographic Influences in American History. Boston, Ginn and Company, 1903.

THREE NEW WEAPONS FOR BUG FIGHTERS

Three new insecticides, two of them chemical and one mechanical, which are expected to be of great aid to farmers and fruit growers in their fight against insect pests, have been developed by the joint forces of the experts on insect fighting of the U.S. Department of Agriculture, of several states, and of the National Cannery Association.

They are calcium cyanide, nicotine dust, and the aphidozer, the latter being the mechanical device, the others chemical. Calcium cyanide is made from lime and the nitrogen of the air and can be produced cheaply in large quantity. It is applied as a dust and is deadly to all insect or other animal life. It is so deadly that considerable care must be used in its application, but its advantage is that the poisonous quality soon wears off in the air and the foliage treated becomes safe.

Nicotine dust is an application of the old-time tobacco dust, of which nicotine is the active principle. In the new preparation it is extracted from the tobacco and then applied in definite concentration to some inert carrier such as slaked lime or sulphur, which is used as a dust to apply to the plants.

Both of these chemicals have been successful against the common pea-louse or aphid, against which the National Cannery Association is waging a determined fight. This insect has given its name to the "aphidozer", a mechanical insecticide. This machine when driven through a field of pea vines, sweeps off the troublesome aphids into a container, as much as eleven pounds of the plant lice having been collected from two and a half acres of peas.

THE EVOLUTION OF THE USELESS

By Dr. Edwin F. Slosson

"What is the use of it?" was the question that used to be asked by an investigator when he found a strange structure or substance in a plant or animal.

He then set himself to finding out the use of it, and sometimes when he could not find out for sure what it was good for he invented a more or less plausible reason for its existence and peculiarities. It never occurred to him that the reason he had difficulty in getting an answer to this question might be that there was no answer to get. For if the investigator lived several generations back, in the age of the Bridgewater Treatises, he assumed that a living creature was constructed like a machine, where every part has a purpose. If he lived one generation back he assumed that all parts and peculiarities of plant or animal were developed from the accumulation of minute favorable variations and, therefore, were, or at least had been, of value to the creature in his struggle for life. This was the theory of "pure Darwinism", but we must remember that Darwin himself was not a pure Darwinian, just as Karl Marx always refused to be classed as Marxian.

But the biologists of the present generation have given up the expectation of finding a use for everything, for they do not now assume that everything is useful in the sense of being a benefit to the creature possessing it. The characteristic under consideration may be an accidental or inevitable accompaniment of its general development. It may be a mere by-product of its life process.

This modern point of view was expressed by A. G. Tansley, president of the Botanical section of the British Association for the Advancement of Science at the recent Liverpool meeting, when he said:

"An organism may produce parts which are useless or even harmful to it, provided that the whole is still able to carry on and reproduce itself in its actual conditions of life.

"In regard to a multitude of characters there is not only no proof but not the smallest reason to suppose that they have now, or ever did have, any survival value at all."

This view will relieve the zoologists and botanists of a lot of the bother they have had in trying to hatch up reasons for everything. Formerly when a plant was found to contain something poisonous or bad tasting, the botanist "explained" it by assuming that the noxious compound was put there or developed there because it kept the plant from being eaten. But the compound is formed by the chemical reactions of the plant's vital processes and it may or may not be a protection to it.

So, too, when the old school entomologist found an insect that looked hideous to human eyes - or that gave off an odor that was disagreeable - to human noses - he assumed that the bug appeared or smelled as horrible to the birds that prey on it as it did to him, and, therefore, its enemies avoided it. Perhaps that was so - and perhaps it wasn't. A skunk undoubtedly makes use of

its poison gas as a weapon of defense, and it certainly is an offensive weapon. But many a poor bug may exude an odor quite as bad in proportion to his size and yet not get any benefit from it. Doubtless he has become so used to his odorous aura as to be quite unconscious of it, and often wonders why he is not more popular in society.

A scientist from Mars studying our earthly ant-hill would be quite puzzled to understand why the automobiles shot out jets of ill-smelling smoke until the happy thought occurred to him that it was for the purpose of preventing pedestrians approaching too close and perhaps climbing on behind. He would wonder why heaps of shale were stacked up around our coal mines. But he would consider the question solved when he surmised that they could serve as ramparts in case the mine mouth were attacked by a mob of strikers.

Man may be "the measure of all things", as Protagoras said, but he is liable to mislead himself when he attempts to put his own meaning into nature.

----- ENGLISH STARLINGS LEARN TO MIGRATE

The English starlings of the northern states, after more than 30 years of residence, have finally learned to migrate. Huge flocks of these birds went south this fall, and will return with the coming of spring, as they did last year. They may truly be said to have been naturalized. Until recently, through sheer ignorance, they have had to adapt themselves to a climate wholly unnatural in its severity, for at home in Northern Europe the species migrates regularly to southern Europe, and even to northern Africa, it is said.

Many of them have managed ordinarily to survive even the rigors of the New England winter, but only because they possessed much resourcefulness in snatching a living under most adverse circumstances. Many of them are still ignorant of the milder climate southward, in a land where food is plenty, and persist in making their night winter quarters in the belfries of the steeples of cities and towns or more rarely in a country barn.

But doubtless these birds or their descendants will hear of the fairer land, and after a time the starling will be much less common in winter in the north. As it is, the winter population in the northern states is growing smaller and that of the middle Atlantic and southern states larger. The result should be a great increase in the starling population of America as a whole, for northern winters like that of last year kill off countless thousands of the birds.

The species may become the pest of which Europeans complain. Flocks grow to incredibly great size, even to hundreds of thousands, and when such a flock descends on orchard, vineyard, or field, nothing remains for the owner. But on the other hand, there are records of insect blights, such as a plague of grasshoppers, being removed almost in a day by the coming of the starling hosts.

The starling has been a resident of the United States since about 1890, when half a hundred of them were released in Central Park, New York. They

multiplied rapidly, and drifted into the surrounding country, and, as years passed, spread farther and farther in the country, until now they are common all through the east and the central states. Their first knowledge of migration, ornithologists believe, probably came from their contact with the flocks of blackbirds and bronze and purple grackles, with which latter species they are confused by many people, though they are easily distinguished by their yellow bills. They mingled with flocks of these and other species, and doubtless began to drift southward with them in the fall and back again in the spring.

READING REFERENCE - Cooke, Wells W. Bird Migration. U.S. Department of Agriculture Bulletin No. 185. Washington, Government Printing Office, 1915.

RHODODENDRONS FROM CHINA FOR U. S. PARKS

Flowers that bloom in China's far-west bandit lands and in Tibetan border country never before visited by white men soon may blossom in America's National Parks for thousands of summer visitors to see.

The greatest rhododendron introduction yet made into the United States is now on its way to this country from a National Geographic Society Expedition.

When last heard from Joseph F. Rock, leader of the expedition, reported that he had collected 914 kinds of rhododendrons. Mr. Rock is the plant explorer who located the chaulmoogra tree, whose oil has brought health to many lepers.

"You simply have no idea of the innumerable species of rhododendrons, from the richest indigo blue to orange yellow, crimson, and absolutely black flowered species," Mr. Rock writes: "They include trees of thirty feet to prostrate plants two or three inches high. The leaves are just as different as the flowers."

Mr. Rock is doing his plant collecting despite the constant menace of outlaws. When he arrived at Likiang, his Yunnan province headquarters, he found 1,200 bandits encamped just north of the town, ready at any moment to sack it. He estimates there were 30,000 bandits in Yunnan alone, in August, not counting the numerous Tibetan border brigands.

"I am working with 23 men," Mr. Rock writes. "Caravans are expensive and it is difficult to get any, no matter what one offers. The muleteers are afraid the robbers will take their mules and if the robbers don't intervene Chinese military officials may commandeer them for months without pay."

An added romance of plant hunting attaches to the shipments from this expedition because of the long, long trail they must travel to reach this country. One consignment of specimens first had to be dragged up and down lofty mountain ranges and borne through deep gorges and dense jungles for 28 days, from Nguluko to Tengyueh. Thence it went to Bhamo and from there was shipped down the Irrawaddy to begin its trans-ocean voyage.

Mr. Rock covered one unknown region, between Yunlung and Cheechuan, along the Hpi Kiang River, not yet on any map. He made his way along the magnificent Yangtze Gorge, 13,000 feet deep, and explored Mount Dyualoko, 20,000 feet and Haba Shan and Chiantashan, each about 18,000 feet. It is from the mountain slopes that plants are being shipped which, he writes, will be suitable for planting in Glacier National Park. He continues:

"These beautiful mountains are indeed a compensation for all the other troubles which the privilege of beholding them entails. I shall be homesick for this wonderful spot."

First pictures ever obtained of the priests of the mysterious, bejewelled Moso tribesmen were taken by Mr. Rock, showing these dignitaries in their curious dances, and devil-exorcising ceremonies.

The range of plant explorations so far has covered the upper Mekong, Salwin, Yangtze, and the Salwin-Irrawaddy divide and "the yield has been tremendous." One objective of the expedition is to find a blight-resisting chestnut tree. Mr. Rock writes that he is shipping a species of the *Castanopsis*, related to the chestnuts, which develops huge trees with trunks from 4 to 6 feet in diameter. He adds:

"*Pinus armandi* is a stately tree, the cones are huge and the seeds large and delicious. I shall send you a mule load."

TABLOID BOOK REVIEW

FASTING AND UNDER-NUTRITION. A biological and sociological study of inanition. By Sergius Morgulis. New York. E.P. Dutton & Company.

A book of exceptional interest to the general reader as well as to the physiologist and physician since fasting has been customary in all ages for religious reasons and is now frequently practiced for hygienic reasons. A comprehensive survey of the subject by the professor of biochemistry in the University of Nebraska College of Medicine.

ROBINSON-CRUSOE SOCIAL ENGINEER. By Henry E. Jackson, New York: E.P. Dutton and Company. \$3.00

A stimulating book on social improvement, showing that the world today is just another Crusoe's island on a gigantic scale. "The aim of this book is to state, in popular and picturesque fashion, what the discovery of a community of interest would mean to modern industry. The author believes that a policy built on this discovery is the path to industrial peace, and there is no other. He also believes that this principle has the creative power to build a New Industrial America."

At Fairbanks, Alaska, which is in the same latitude as Iceland, three men were prostrated by the heat last summer.
